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Appendix B

The Commonwealth of Massachusetts

Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

August 4, 2005

Steven Soule, Facilities Supervisor
Berkshire Hills Regional School District
207 Pleasant Street
P.O. Box 596
Housatonic, MA 01236

Dear Mr. Soule:

At the request of a parent and in cooperation with Sandra Martin, Great Barrington Board of Health, the Center for Environmental Health (CEH) conducted an evaluation of the indoor air quality at the Muddy Brook Regional Elementary School (MBRES), Monument Valley Road, Great Barrington, Massachusetts on July 29, 2005. Michael Feeney, Director of CEH's Emergency Response/Indoor Air Quality (ER/IAQ) conducted this evaluation. Concerns about mold as a result of excessively humid weather during the month of July 2005 prompted the request for a building assessment. As reported to MDPH staff, a musty odor exist was detected on the first floor of the building during hot, humid weather after school classroom materials were moved into the building. Classrooms were examined on each floor in both wings of the building by MDPH staff. The band room had detectable musty odors, however no other rooms had similar odors. The musty odor in the band room was traced to a variety of instrument cases that were found within this room. A number of violin cases were opened and each had a distinct musty odor, indicating likely mold contamination. The instrument cases are constructed of leather, cardboard, glue and carpet-like lining, all porous materials that can support mold colonization. Two days prior to this assessment, the MBRES heating, ventilating and air-conditioning (HVAC) system was activated to provide cooling. Air-conditioning in the building had not been operating prior to that time, which means that the interior environment of the building related to temperature and relative humidity would be expected to roughly match that of the outdoor environment.

Relative humidity in excess of 70 percent can provide an environment for mold and fungal growth (ASHRAE, 1989). In the experience of MDPH staff, excessively humid weather can provide enough airborne water vapor to create adequate conditions for mold growth in buildings, particularly in school materials that are stored under these conditions. In general, materials that are prone to mold growth can become colonized when moistened for 24-48 hours or more. Since hot, humid weather persisted in Massachusetts for a number of days during the month of July, it is likely that the instrument cases were moistened for an extended period of time. If moistened materials were not dried with mechanical aids within a 24-48 hour period (e.g. fans, dehumidifiers, air-conditioning), mold growth may occur.

During the course of the MDPH assessment, gypsum wallboard (GW) and ceiling tiles were examined. No mold colonies were observed on these materials. Moisture sampling throughout the MBRES found moistened GW in an exterior wall of the OP/PT room, next to the music room; however, no musty odor was detected in this room. The softness of the GW (Picture 1) combined with the moisture sampling indicated that this wall appears to be chronically water damaged, most likely from water penetration through the exterior wall. The last appreciable rainfall in the general Great Barrington area occurred July 27, 2005, two days prior to the MDPH visit to the school.

The GW in the OP/PT room is affixed to an exterior wall that is partially buried beneath an embankment of soil (Picture 2). Examination of this wall revealed the following conditions that indicate chronic wetting.

- A roof scupper empties on to the top of the embankment (Picture 3). A furrow likely created by erosion by rainwater was noted along the soil/exterior wall junction (Picture 4).
- Brick on the exterior wall was caked with mud 2-3 feet above the ground (Picture 5), likely created by water/mud mixture splashing on this wall. Please note that no other wall of the MBRES exhibits this phenomenon.
- Water is pooling at the base of the embankment [the lack of grass growth in this area versus (Picture 6) versus the lawn along the front of the building (Picture 7) supports this hypothesis].
- GW moisture measurements throughout the MBRES rooms were dry, with the exception of the GW in the OP/PT room.

In this condition, this exterior wall is subject to chronic water exposure. This condition is likely playing a role of either providing a direct moisture source or creating conditions that would result in the production of condensation within the wall space. The GW in the OP/PT room should be removed and the source of the moisture be remediated.

The exterior walls in the uphill wing had a number of features that may prove a problem in the future. First, a significant section of the building flashing is buried below the gravel placed along the edge of the building. A significant number of weeping holes were also buried. Weep holes allow for accumulated water to drain from a wall system (Dalzell, 1955). Failure to install weep holes in brickwork or burial of weep holes below grade will allow water to accumulate in the base of walls, resulting in seepage and possible moistening of building components (Figure 3). It is advised that “[i]n no case should the holes be located below grade”, since dirt can fill weep holes to prevent drainage (Dalzell, 1955).

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials be dried with fans and heating within 24-48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended.

In order to avoid potential mold and related spore movement during remediation, the following recommendations should be implemented in order to reduce contaminant migration into adjacent areas:

1. Use local exhaust ventilation and isolation techniques to control pollutants that may exist during remediation. The design of each system must be assessed to determine how it may be impacted by remediation activities. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail: shutting down systems during periods of cleaning, when possible; ensuring systems are isolated from contaminated environments; sealing ventilation openings and utilizing filters with a higher dust spot efficiency where needed (SMACNA, 1995).

2. Consider taking the following precautions to avoid the re-entrainment of these materials into the HVAC system at the MDRES:
   a. Deactivate the ventilation systems and close all windows in the area to be cleaned. Place an industrial sized fan in an open exterior door or window to provide exhaust ventilation for areas to be cleaned. Be sure to place this exhaust fan in a manner to draw airborne particles away from clean areas of the building**.** This will draw air through univent filters and prevent uncontrolled draw of outdoor pollutants into clean areas of the building.
   b. Seal air diffusers and return vents with polyethylene plastic in the areas to be cleaned. Vents for the exhaust vent system should be sealed in a similar manner.

3. Clean surfaces that do not have visible mold colonies with a vacuum cleaner equipped with a high efficiency particle arrestance (HEPA) filter. Musical instruments should be cleaned using this method. If wood based instruments (e.g. violins) have an odor after cleaning with this method, consult a luthier or violinmaker for cleaning advice.

4. Discard porous materials that are contaminated with mold or are water damaged (e.g. musical instrument cases and GW in the OP/PT room).

5. Disinfect non-porous materials (e.g., doorframes, linoleum, cement, Lucite topped metal desks and chairs, wood surfaces) with an appropriate antimicrobial agent. Clean non-porous surfaces with soap and water after disinfection. As soon as this second cleaning is completed, use fans that introduce air from other clean areas or dehumidifiers to dry cleaned area.

6. Seal vents in each classroom to be cleaned with polyethylene plastic and duct tape to prevent pollutant migration into uncontaminated areas of the building. Once cleaning is completed, remove plastic from vents in cleaned area and reactivate ventilation components (supply and exhaust). Consider creating an air lock in the hallway to reduce migration of mold contaminants to unaffected areas of the school.

7. Consult *Mold Remediation in Schools and Commercial Buildings* published by the US Environmental Protection Agency (US EPA) (US EPA, 2001) for further advice on mold remediation and measures to protect individuals conducting mold cleaning. Copies of this document can be downloaded from the US EPA website at: http://www.epa.gov/iaq/molds/mold_remediation.html.

We suggest that the majority of these steps be taken on any remediation/renovation project within a public building. We would be happy to conduct additional tests to address any other IAQ issues or concerns at the school after the heating season begins. Please feel free to contact us at (617) 624-5757 if you are in need of further information or if you would like us to conduct further testing in the fall.

Sincerely,

Michael A. Feeney, R.Ph., J.D., C.H.O.
Director, Emergency Response/Indoor Air Quality Program

cc/ Suzanne K. Condon, Associate Commissioner
Sandra Martin, Health Agent, Great Barrington Board of Health
Donna E Moyer, Superintendent, Berkshire Hills Regional School District
Senator Andrea F. Nuciforo, Jr.
Representative William Smitty Pignatelli

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

ASHRAE. 1989. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigeration and Air Conditioning Engineers. ANSI/ASHRAE 62-1989

Dalzell, J.R. 1955. *Simplified Masonry Planning and Building*. McGraw-Hill Book Company, Inc. New York, NY.

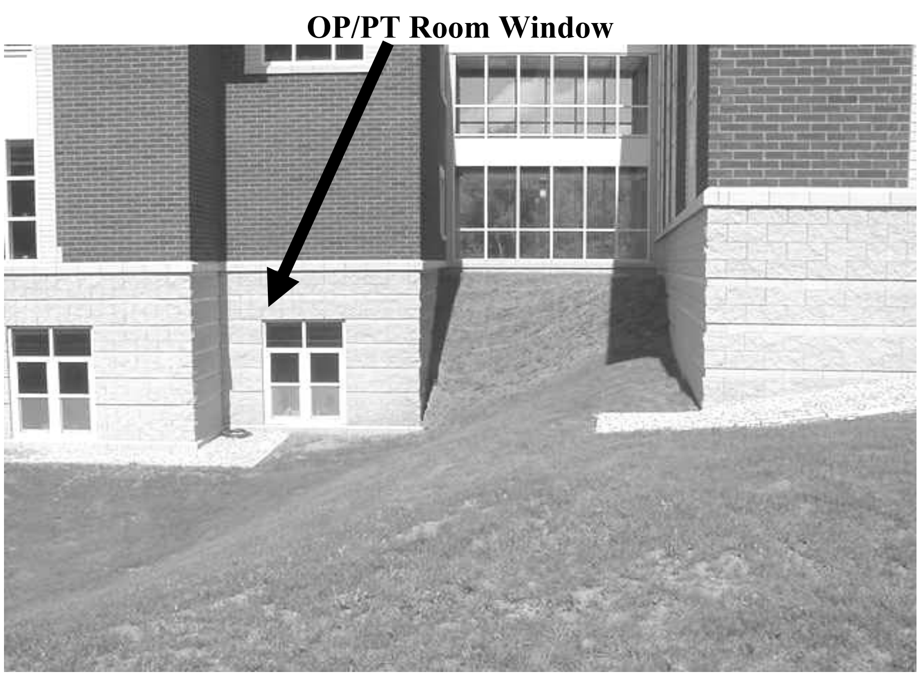
SMACNA. 1995. IAQ Guidelines for Occupied Buildings Under Construction. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

US EPA. 2001. Mold Remediation in Schools and Commercial Buildings. US Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. March 2001.

Picture 1

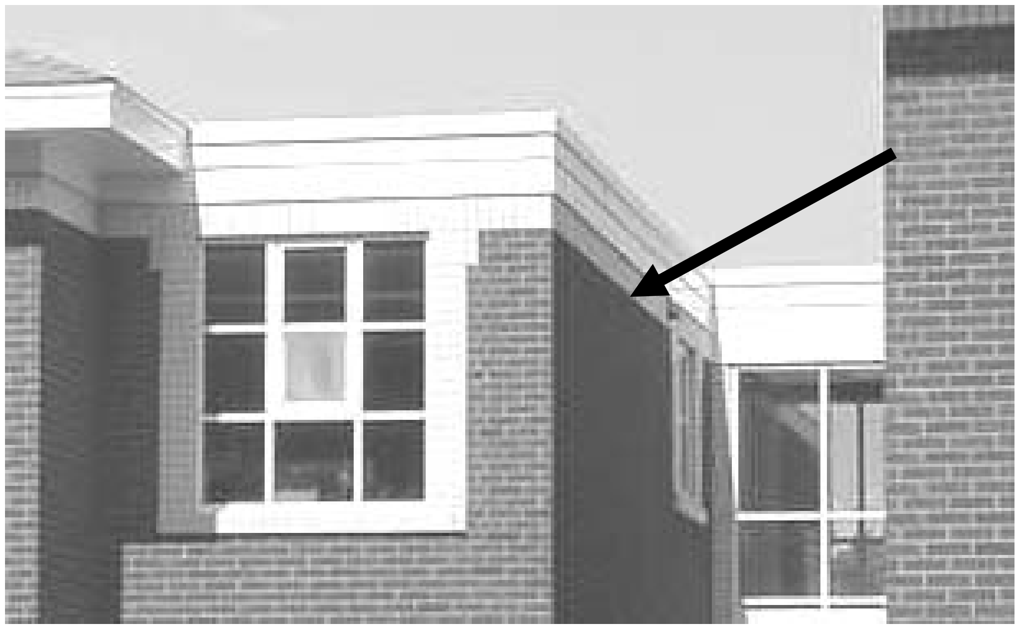
Moistened Gypsum Wallboard in OP/PT Room

Picture 2



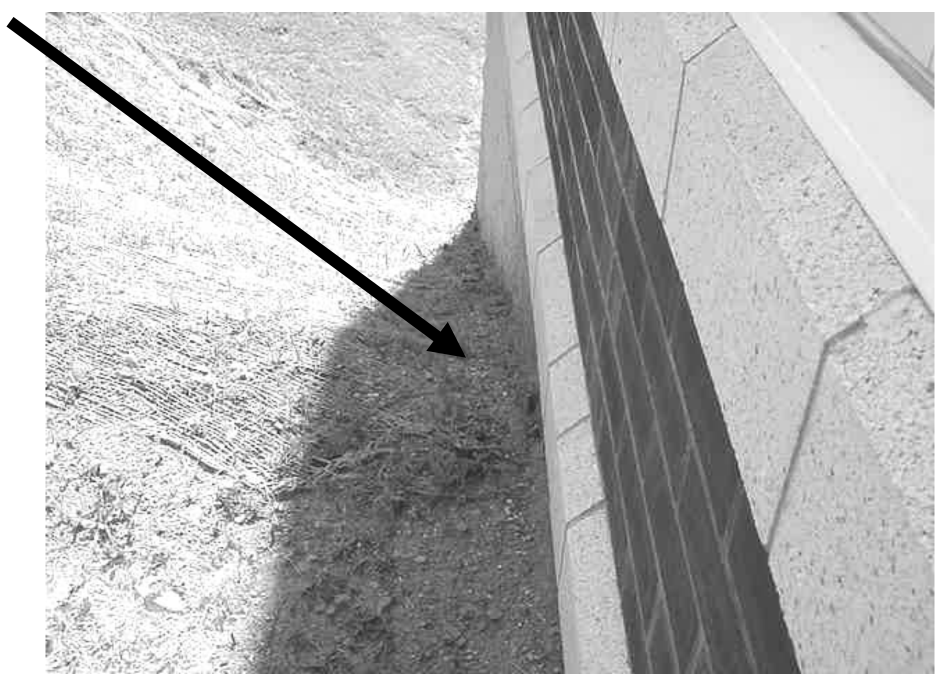
OP/PT Room Exterior Wall Partially Buried Beneath Embankment

Picture 3



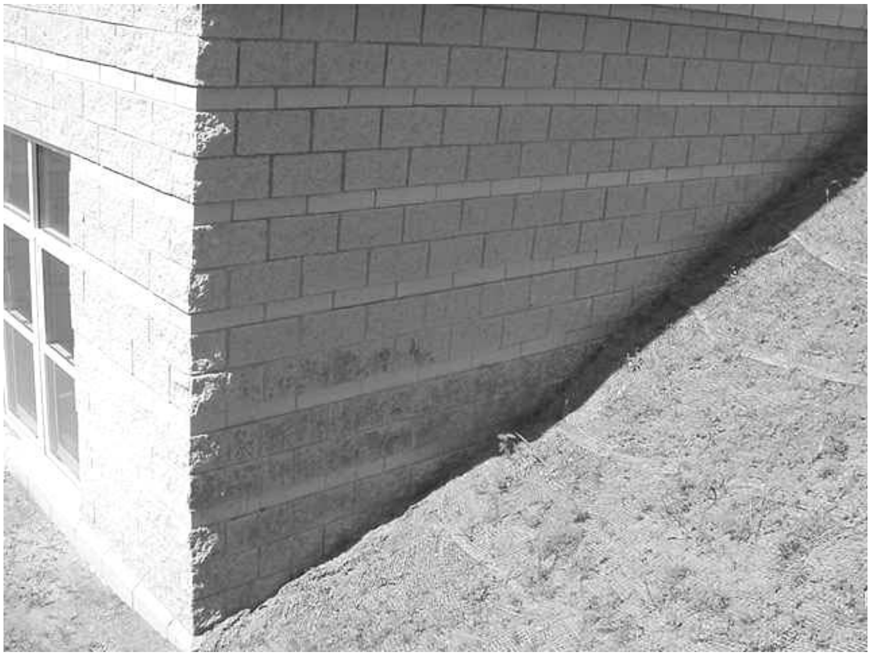
Scupper That Drains Excess Water from Roof

Picture 4



Furrow in Soil along Exterior Wall (Note Eroded Soil at Base of Wall)

Picture 5



Brick Is Of the Exterior Wall Were Caked With Muddy 2-3 Feet above the Ground

Picture 6

Water Is Pooling At the Base of the Embankment, As Exhibited By the Lack of Grass Growth

Picture 7

Lawn In Front Of Building, Compare To Picture 4